

REMARKS

By the present Response, Applicants will have amended claim 1 by incorporating therein the significant recitations of claims 8, 9, 10 and 11. In addition, claim 18 will have been rewritten into independent form including the limitations of claim 1 as well as the limitations of claims 19 and 28 which originally depended from claim 18. Further, claim 18 will have been amended to clarify a feature thereof without raising a new issue. Claims 29-34 will have been canceled without prejudice or disclaimer of the subject matter.

Moreover, in amending the claims, of course the dependencies of various dependent claims have been changed to compensate for intermediate claims that have been canceled and the language of independent claims 1 and 18 will have been modified to eliminate redundancies and otherwise improve the language and clarity of the claims without significantly changing the scope or meaning thereof.

The above-noted incorporation of the limitations of claims 8, 9, 10 and 11 into claim 1 as well as the incorporation of the features of claims 19, 28 and 18 into claim 18 is expressly made without in any manner acquiescing in the propriety of the Examiner's rejection. Rather, these amendments have been made solely in order to eliminate any outstanding issues and provide a clear and straightforward basis for the patentability of the claims in view of the status of the present application as being After Final Rejection.

In view of the herein contained amendments and remarks, Applicants respectfully traverse the rejections of the claims set forth in the above-mentioned Official Action.

In particular, in the outstanding Official Action, the Examiner rejected claims 1, 8-24, 27-29 and 31-34 under 35 U.S.C. § 103(a) as being unpatentable over CHRISTIE

(1995) in view of OHTOMO et al. (U.S. Patent No. 5,95,233). Applicants respectfully traverse the above rejection and submit that it is inappropriate with respect to the combination of features recited in Applicants claims.

Applicants invention, as recited in claim 1, is directed to a three-dimensional image capturing device. The image capturing device of the present invention includes a light source that radiates a light beam, an image device that accumulates signal charges corresponding to a quantity of light received on the image device, and a distance information sensing processor that controls radiating of a distance measuring light beam from the light source to a measurement subject and detects distance information relating to the measurement subject by receiving a reflected light beam from the measurement subject. The distance information sensing processor radiates the distance measuring light beam from the light source a predetermined number of times, so that signal charge is accumulated in the image device due to each radiation of the distance measuring light beam.

Applicants invention further includes a data transmitting processor that controls radiating of a data transmitting light beam from the light source so that data is transmitted to an external device, wherein the light source outputs the distance measuring light beam and the data measuring light beam in a single operation and wherein a series of the distance measuring light beams and a series of the data transmitting light beams are superposed so that that data transmitting light beams are radiated in the intervals between the distance measuring light beams and timing for radiating the data transmitting light beams is based upon the timing of the radiation of the distance measuring light beams.

It is respectfully submitted that the combination of features recited in Applicants claim 1 is not taught, disclosed nor rendered obvious by either CHRISTIE or OHTOMO et al., or any proper combination thereof.

In this regard, CHRISTIE discloses the basic principle of three-dimensional image capturing methods and discloses a light source, an image device and a distance information sensing processor. However, CHRISTIE lacks any disclosure or suggestion of a data transmitting processor that control radiating of a data light beam from the light source so that data is transmitted to an external device. Accordingly, CHRISTIE can also contain no disclosure relating to the outputting of the distance measuring light beam and the data transmitting light beam in a single operation or any other claim recitations relating to the data transmission. These facts, of course, are recognized by the Examiner in combining the teachings of OHTOMO et al. with the disclosure of CHRISTIE. However, even in the combination with OHTOMO et al., the disclosures of the references relied upon by the Examiner do not teach the combination of features recited in Applicants invention. As an example of the shortcomings of the combination of references relied upon by the Examiner, Applicants note that claim 1 requires, inter alia, that the data transmitting light beams are radiated in the intervals between the distance measuring light beams. This feature was previously recited in Applicants claim 11 but is not taught, disclosed nor rendered obvious by the combination of references relied upon by the Examiner.

In addressing claim 11 in the outstanding Official Action, the Examiner asserted that OHTOMO et al. discloses this feature and directed Applicants attention to column 13, line 53 through column 14, line 10. However, it is respectfully submitted that the

Examiner is in error regarding the disclosure of OHTOMO et al. In particular, the paragraph of OHTOMO et al. to which the Examiner directs Applicants attention relates to the PSK (phase shift) modulation that is used for transmitting the measured data to the reflecting unit. However, according to OHTOMO et al., PSK modulation is performed by keying of the reference signal with a frequency of 300 khz by digital binarized signal of the measurement results. However, as a direct result of the usage of PSK modulation in OHTOMO et al., the data transmission cannot be carried out in the intervals between the output of the distance measurement light beams. As set forth at column 16, lines 13-14, "this PSK modulation is to perform distance measurement and data communication at the same time" rather than data transmission being performed in the intervals between the distance measuring light beams. Thus, the PSK modulation of OHTOMO et al. is incompatible with the recitations of claim 1.

As a result of the invention described in claim 1, distance measurement can be carried out in the same operation regardless of the presence of data and thus data transmission control can be simply added to the distance measurement. As noted above, this feature is not disclosed nor taught by OHTOMO et al. At least for this reason, it is respectfully submitted that the features of claim 1 are clearly patentable over any proper combination of CHRISTIE and OHTOMO et al.

Applicants invention, as recited in claim 18, is also directed to a three-dimensional image capturing device which includes a light source that radiates a light beam, an image device that accumulates signal charge corresponding to a quantity of light received on the image device, a distance information sensing processor that controls radiating of a distance measuring light beam from the light source to a

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measurement subject and detects distance information which relates to the measurement subject by receiving a reflected light beam from the measurement subject.

Applicants invention further includes a data transmitting processor that controls radiating of a data transmitting light beam from the light source, so that data is transmitted to an external device, wherein the light source outputs the distance measuring light beam and the data transmitting light beam in a single operation. According to the features of Applicants invention, an accumulation of the signal charge in the image device is synchronously carried out while the data transmitting light beam is out put so that the data transmitting light beam can be used as the distance measuring light beam and the data transmitting light beams and the distance measuring light beams are superposed with each other. The distance information sensing processor radiates the distance measuring light beams from the light source a predetermined number of times so that signal charge is accumulated at the image device due to each radiation of the distance measuring light beam and the distance information sensing processor is actuated and the data transmitting light beams are radiated during a distance measuring period, in which the distance measuring light beams are repeatedly radiated the predetermined number of times.

Further, the distance measuring period comprises a data transmitting period in which the distance measuring light beams and the data transmitting light beams are superposed and radiated and a supplemental light emitting period, in which distance measuring light beams are radiated so as to supplement the number of the distance

measuring light beams radiated in the data transmitting period by a number sufficient to obtain the predetermined number of times.

It is respectfully submitted that the combination of features recited in Applicants claim 18 is not taught, disclosed nor rendered obvious by any proper combination of CHRISTIE and OHTOMO et al.

In this regard, the Examiner asserts that the supplemental light emitting period is disclosed by CHRISTIE, page 1304, first paragraph. However, it is respectfully submitted that this portion of CHRISTIE contains no mention whatsoever of a supplemental light emitting period. This feature of Applicants invention is set forth at pages 55-56 of Applicants invention and is illustrated in Figs. 27-29 of the present invention. As a result, even when the number of signal charge accumulations in each data period is low, the accuracy of the distance measurement can be maintained at an acceptable level. Not only does the cited paragraph of CHRISTIE not disclose utilization of a supplemental light emitting period but it does not even appear to disclose radiating the distance measuring light beams from a light source a predetermined number of times. Accordingly, it is respectfully submitted that the combination of CHRISTIE and OHTOMO et al. cannot render unpatentable the combination of features recited in Applicants claim 18.

Additionally, Applicants submit that the Examiner has not set forth, nor is there, any proper motivation for the combination of CHRISTIE and OHTOMO et al. As previously noted, and as admitted by the Examiner, CHRISTIE does not disclose a data transmitting light beam, but only discloses a distance measuring light beam. OHTOMO et al.'s disclosure relates to the emission of distance measuring light beam by phase

shifting. Further, the number of times that the distance measuring light is emitted is independent of the data transmission. Accordingly, there is no motivation for the obviousness of providing a supplemental light emitting period that is used to compensate for the number of times that the distance measurement light beams are emitted which is dependent upon the data transmission, as in the present invention.

In this regard, Applicants respectfully direct the Examiner's attention to the disclosure starting at page 55, line 5 and in particular to the disclosure at page 57, lines 3-17. Accordingly, since CHRISTIE does not disclose data transmitting light beams and since OHMOTO et al. discloses phase shifting and the emission of distance measurement light beams is independent of the emission of data transmission light beams, it is respectfully submitted that there is no motivation for combining these features to arrive at the combination of features recited in Applicants claims. Accordingly, for yet this additional reason, It is respectfully submitted that claim 18 is clearly patentable over the combination of CHRISTIE and OHMOTO et al.

Accordingly, in view of the above amendments and remarks, Applicants respectfully request reconsideration and withdrawal of the outstanding rejection applied against claims 1 and 18. Such action is respectfully requested and is now believed to be appropriate and proper.

Applicants note that the status of the present application is After Final Rejection and in accordance with such status, Applicants note that they do not have a right to amend the application. Nevertheless, in accordance with the provisions of 37 C.F.R. § 1.116, Applicants respectfully submit that entry of the present amendment is appropriate and proper. In particular, the claims have merely been amended by the incorporation of

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features previously recited in various dependent claims as well as to clarify a recited feature. Accordingly, none of the amendments proposed herein give rise to any new issues requiring further consideration or search. Moreover, the claims in the present application clearly place the present application in condition for allowance, at least as has been set forth. Finally, these amendments could not have been previously made because the Examiner did not cite the OHTOMO et al. reference prior to the outstanding Official Action.

Accordingly, Applicants respectfully request entry of the present amendment, reconsideration and withdrawal of the outstanding rejection, and an indication of the allowability of all the claims pending herein, in due course.



SUMMARY AND CONCLUSION

Applicants have made a sincere effort to place the present application in condition for allowance and believe that they have now done so. Applicants have amended the claims and have pointed out the shortcomings and deficiencies of the references with respect to the features recited in Applicants claims. Applicants have further discussed the disclosure of the references and have contrasted the same with the recitations of the claims in the pending application. Accordingly, Applicants have provided a clear evidentiary basis supporting the patentability of all the claims in the present application and respectfully request an indication to such effect in due course.

Applicant have pointed out a basis for entry of the present claims in spite of the fact that the status of the present application is After Final Rejection.

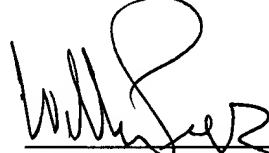
Accordingly, Applicants respectfully request entry of the present amendment, reconsideration of the outstanding rejection, and an indication of the allowability of all the claims pending in the present application.

Any amendments to the claims which have been made in this amendment, and which have not been specifically noted to overcome a rejection based upon the prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.


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Should the Examiner have any questions or comments regarding this Response, or the present application, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,  
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